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OPTICAL SOCIETY *of* AMERICA

VOLUME 28
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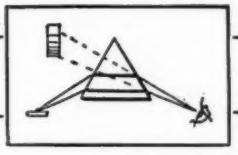

JUNE
1938

Directory Number

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FOR AND UNDER THE EDITORIAL SUPERVISION OF
THE OPTICAL SOCIETY OF AMERICA

THE OPTICAL SOCIETY OF AMERICA

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THE OPTICAL SOCIETY OF AMERICA was organized in 1916 "*to increase and diffuse the knowledge of optics in all its branches, pure and applied, to promote the mutual interests of investigators of optical problems, of designers, manufacturers and users of optical instruments and apparatus of all kinds and to encourage cooperation among them.*" It aims to serve the interests of all who are engaged in any branch of optics from fundamental research to the manufacture of optical goods.

MEMBERSHIP

Regular Members: "Any person who has contributed materially to the advancement of optics is eligible for regular membership."

Associate Members: "Any person who is interested in optics is eligible for associate membership."

Corporate Members: "Any corporation desirous of encouraging the work of the Society is eligible for corporation membership."

The Society cordially invites to membership all who are interested in any branch of optics, either in research, in instruction, in optical or illuminating engineering, in the manufacture and distribution of optical goods of all kinds or in physiological and medical optics.

ANNUAL DUES

Regular members, $7.50; Associate members, $5.00; Corporate members, $50.00. These dues include subscription to the Society's official journal, the *Journal of the Optical Society of America.*

MEETINGS

The Society holds two meetings per year: An annual meeting in the autumn and a midwinter meeting jointly with the American Physical Society.

For further information concerning the Optical Society of America address the Secretary, Dr. L. B. Tuckerman, National Bureau of Standards, Washington, D. C.

Journal of the
OPTICAL SOCIETY *of* AMERICA

VOLUME 28 JUNE, 1938 NUMBER 6

The Optical Society of America, Incorporated

PURPOSE AND SCOPE OF THE SOCIETY

THE Optical Society of America is a national organization founded in 1916 in order to provide an association for all those interested in optics. In 1932 it was incorporated under the laws of the state of New York "to increase and diffuse the knowledge of optics, to promote the common interests of investigators of optical problems, of designers and users of optical apparatus of all kinds, and to encourage cooperation among them." It serves a need which is not met by the scientific organizations devoted specifically to physics, chemistry, psychology and biology, all of which sciences are interested in certain phases of optics, either from the side of theory or application. Thus the physicist is interested in the fundamental phenomena of the production, propagation and measurement of radiant energy, including visible radiant energy or light, largely as an objective science, irrespective of the interpretation of optical phenomena by the eye. The physiologist and psychologist are primarily interested in the effects of radiant energy in the eye and mind of the observer, while the biologist is interested in its effects on living tissues. The chemist is interested in optics as providing marvelously sensitive tools for analysis, and in light as a factor in chemical reactions. In the field of applied science we find the illuminating engineer, the motion picture engineer, and the artist all vitally dependent on optics for their work. The Optical Society is the common meeting ground for these widely distributed interests, all of which utilize special aspects of optics, but of which no one is primarily concerned with its advancement.

THE SCOPE OF OPTICS

The field which the Optical Society covers is exceedingly broad. Originally, as the Greek origin of the name implies, optics had to do merely with seeing, or with "light," in the narrow sense of visible radiant energy. Beginning, however, with the discovery in 1800–1801 of infra-red and ultraviolet radiant energy, obeying the same laws as "light," but not perceptible to the eye, the scope of optics has continually widened, until we now have as dominantly optical phenomena such recent acquisitions as Roentgen rays, gamma-rays, the propagation of radio waves, and "electron optics." At the same time great advances have been made in the study of that part of the radiant energy spectrum perceptible to the eye, for instance in the field of color. A distinguished former president of the Society in attempting a definition of optics which would indicate the field of study of the Optical Society, so described it: "Optics is the science which deals

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with radiant energy, its genesis, its propagation, the effects which it suffers, the effects which it produces, and all phenomena closely associated with it."

The record of the contributions of optics to science and human welfare is extraordinary, and warrants pride in being associated with the optical fraternity. In this fraternity are listed some of the world's most illustrious minds and scientific benefactors—Leonardo da Vinci, Galileo, Newton, Leuwenhoek, Huygens, Herschel, Fraunhofer, Helmholtz, Abbe, Michelson, and many others. The oldest of sciences, astronomy, cannot be conceived to have existed without the science of optics, and its latest developments through the spectroscope and interferometer are further triumphs of optics. That experiment which has had perhaps the most far-reaching speculative results of our time—the Michelson-Morley experiment—is entirely optical. Our ultimate standards of length are determined optically. All the determinations of length and position involved in accurate surveying, which make possible the great bridges and other engineering triumphs of the present age depend upon refined optical instruments. Our accurate time system would have been practically impossible of establishment without the telescope. To the genius of Fresnel we owe not only some of the most fundamental scientific conceptions of optics but the lenses used in the lighthouses of the world. The maps of the mariner and explorer have been produced by the instruments and techniques of optics, to which the art of photography—also included in the scope of the Optical Society—has lately added a powerful adjunct in aerial photography. One of the earliest, and perhaps the most important of all contributions of optics to human welfare was the invention of the spectacle lens. With over half the intellectual leaders of the world using spectacles, it is evident that the absence of this optical aid would be an incalculable loss. One cannot imagine the science of biology without the microscope, and the science of medicine deprived of the knowledge acquired in the past through the use of the microscope would almost put us back in the dark ages in our treatment of disease. The ophthalmoscope, an outstanding application of optical theory, is absolutely indispensable to the diagnosis of eye conditions. Large industries, particularly the producers of paints, dyes and textiles, utilize, and will utilize far more in the future, the measuring, specifying and standardizing methods which optics alone can supply. The motion picture, with its demands on optical and photographic knowledge; the automobile, dependent on optical design for satisfactory headlights, are also to be numbered among the customers of modern optics.

Historical Note

THE organization of the Optical Society of America in 1916 came at a time when the development of optics and its applications was receiving great attention throughout the world, particularly in the great national standardizing laboratories—the Physikalische-Technische Reichsanstalt, the National Physical Laboratory and the National Bureau of Standards. The establishment of the optics division in the National Bureau of Standards may perhaps be taken as the first definite recognition of the general technological importance of optics in America. This period was marked by the appearance of the bureau's circulars on *Optical Instruments and Optical Properties of Materials*, and Nutting's *Applied Optics* (1912). The development of technological optics was also receiving increased attention in the newly founded institutional and industrial research laboratories, such as the Geophysical, General Electric, Eastman, Western Electric, and the Bausch and Lomb Scientific Bureau. The manufacture of optical glass and optical instruments was taken up on a broad scale in this country, particularly during the war period.

These numerous activities in optics appeared to call for an organization definitely directed to this subject; and, upon the initiative of Dr. P. G. Nutting, a local society was founded in Rochester in 1914. The founding of a national society was proposed in 1916 by a notice in *Science*, followed

by invitations to a selected group to become charter members. Shortly thereafter the Society wasorganized with the following charter members:

Adelbert Ames, Jr.
Edward Bausch
E. J. Bissell
William Churchill
Louis Derr
Marshall D. Ewell
C. W. Frederick
Henry P. Gage
George E. Hale
Edward P. Hyde
Herbert E. Ives
L. A. Jones
Hermann Kellner
C. H. Kerr
Walter B. Lancaster
Adolph Lomb
Norman Macbeth
C. E. K. Mees
Howard D. Minchin
P. G. Nutting
C. F. Prentice
Irwin G. Priest
W. B. Rayton
F. K. Richtmyer
F. E. Ross
F. B. Saegmuller
J. P. C. Southall
E. D. Tillyer
E. J. Wall
Fred E. Wright

Since that date, with some interruption caused by war conditions, the Society has carried on its regular activities and has contributed extensively to the advancement of optics in America. In 1931 it joined with the Physical Society, the Acoustical Society, the Society of Rheology and the Association of Physics Teachers in the organization of the American Institute of Physics Incorporated, becoming one of the founder societies of that organization.

Activities of the Optical Society

THE Society carries on its work through meetings, publications, committees and representatives and delegates to other technical organizations interested in optical problems. There are two regular meetings a year, one in the Fall, in October, denominated the "annual meeting" and customarily of three days' duration, and a meeting in February or March usually a joint meeting with the American Physical Society. At these meetings original papers on various topics in optics are presented, together with symposia on selected subjects. The Society has published its "Journal," continuously since its foundation, except for an interruption due to war activities. It now appears monthly. For a period of years it also published in conjunction with the Association of Scientific Apparatus Makers of America, *The Review of Scientific Instruments*, either under the same cover or as a separate journal. This has now been taken over by the American Institute of Physics.

As a noteworthy special project the Society published in 1924 an English translation of Helmholtz' *Physiological Optics*, under the editorship of J. P. C. Southall. Among the most valuable publications of the Society are to be listed the numerous reports prepared by special committees to review selected fields of optics, and presented in the Journal. Of these special mention may be made of the report on "Colorimetry" which has become a classic, now long out of print, and to be succeeded by a new edition now in preparation.

Through its representatives and delegates it has contributed materially to national and international standardization especially in the fields of photometry, colorimetry, and photography.

American Institute of Physics

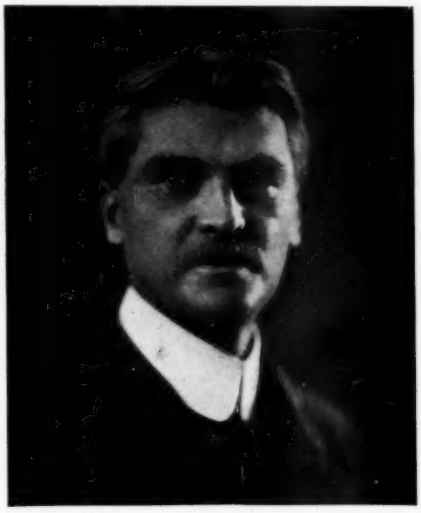
THE Optical Society of America has been a founder society of the American Institute of Physics, since the foundation of the Institute in 1931. It cooperates with the other founder societies in supporting and furthering the work of the Institute in advancing the science and profession of physics and in promoting cooperation between pure research, the applied sciences and the industries. The Institute in its turn serves the Society as it serves the other founder societies by publishing the Journal of the Society under the editorial supervision of the Editor and Associate Editors selected by the Society.

Metals and Awards

THE Society has two funds to be used for the recognition of distinguished work in optics and its advancement, the Frederic Ives Medal and the Adolph Lomb Memorial Fund.

The Frederic Ives Medal

This medal, endowed by Dr. Herbert E. Ives in 1928, is named in honor of his father, Frederic Ives, distinguished for his pioneer contributions to color photography, photoengraving, three-color process printing, and other branches of applied optics. It is awarded by the Optical Society of America for distinguished work in optics. It is expected that the award will generally be made biennially on the occasion of the second annual meeting in each administration. The medal was awarded in 1929 to Professor Edward Leamington Nichols, in 1931 to Professor Theodore Lyman, in 1933 to Professor R. W. Wood, in 1935 to Dr. George Ellery Hale and in 1937 to Dr. Herbert E. Ives.



Adolph Lomb

The Adolph Lomb Memorial

Adolph Lomb was treasurer of the Society from its foundation until his death on September 30, 1932. In recognition of his devotion to the interests of the Society and the advancement of optics, the Adolph Lomb Memorial Fund was established by the Society in 1934. "The income of this fund is to be expended, in the discretion of the board of directors, for purposes in keeping with the objects of the Society, and appropriate as memorials, such as the establishment of a memorial lectureship; awards for distinguished service to the Optical Society of America; awards for outstanding contributions to optical science; and the like."

The Society has decided to expend a part of the income from this fund to secure, from time to time, distinguished speakers for an Adolph Lomb Memorial Lecture. At the meeting of the Society in New York, February 25, 1938, the first Adolph Lomb Memorial Lecture was given by Dr. Harlow Shapley, Director of the Harvard College Observatory, who spoke on "The Debt of the World to Optical Science."

Organization

The Society functions under its Articles of Incorporation and its By-Laws.

By-Laws of The Optical Society of America, Inc.

Adopted May 26, 1933

Article I

Membership

Section 1. Classes of Membership: Membership in the society shall be regular, associate, corporation, or honorary.

Section 2. Charter Members: The members of the unincorporated association, The Optical Society of America, at the time of the incorporation of said society shall be members in their respective classifications of The Optical Society of America, Inc. The charter members of the unincorporated society shall be known as the charter members of the incorporated society.

Section 3. Eligibility: Any person who has contributed materially to the advancement of optics is eligible for regular membership.

Any person who is interested in optics is eligible for associate membership.

Any corporation desirous of encouraging the work of the society is eligible for corporation membership.

Any person who has rendered eminent service in the advancement of optics may be elected to honorary membership.

Section 4. Application for Membership: Applications for membership must state the candidate's name and qualifications for membership and must be signed by two members of the society.

Section 5. Election to Membership: All applications from individuals for membership shall be considered first as applications for associate membership and shall be acted upon as such. Applicants shall become associate members when their duly prepared applications have received the written approval of three members of the board of directors.

Applicants for corporation membership shall become corporation members when their duly prepared applications have received the written approval of three members of the board of directors.

Associate members may be transferred to regular membership at the regular annual meeting of the board of directors by a two-thirds (2/3) vote of the members of the board present.

Honorary members may be elected at the regular annual meeting of the board of directors by the unanimous vote of the entire board. In case any members of the board are not in attendance their ballots must be obtained by the secretary. The number of honorary members shall at no time exceed five (5).

Section 6. Duties and Privileges: Regular members shall have the right to vote, hold office, attend meetings, and receive the journal of the society and such other publications as the board of directors may direct.

Associate members shall have the same privileges as regular members except that they may not vote or hold office.

Corporation members shall receive the journal of the society and such other publications as the board of directors may direct. Their representatives may attend all meetings of the society.

Honorary members shall have all of the privileges of regular members.

Section 7. Termination of Membership: Membership in the society may be suspended or terminated by vote of the board of directors. Failure to pay dues for one (1) year shall be deemed sufficient cause for suspension or termination of membership.

Section 8. Dues: The dues for regular members shall be seven dollars and fifty cents ($7.50) per annum.

The dues for associate members shall be five dollars ($5.00) per annum.

The dues for corporation members shall be fifty dollars ($50.00) per annum.

The payment of one hundred dollars ($100.00) in one sum shall exempt any regular or associate member from the subsequent payment of dues for the remainder of his life.

Section 9. Patrons: The payment, within any one year, of one thousand dollars ($1000.00) or more toward the expenses of the society by any corporation or individual shall entitle such corporation or individual to the rank of patron of the society, for a period of ten years in the case of a corporation, and for life in the case of an individual.

Section 10. Ownership of Corporation Property: The corporation shall not be operated for profit and its entire properties, assets, and facilities shall be devoted to the purposes for which it is organized as set forth in its certificate of incorporation as the same may be from time to time amended. No member shall have any right to or any share or interest in any of the property or assets of the corporation.

Article II

Meetings of Members

Section 1. Annual Meeting of the Corporation: During October of each year at a time and place to be fixed by the board of directors, there shall be held the annual meeting of the members of the corporation for the election of directors and officers (if not previously elected by mailed ballot as hereinafter provided), and for the rendering to the membership of the annual report of the directors as required by law, and for the transaction of such other business as may properly come before the meeting.

At each annual meeting the directors shall present a report verified by the President and Treasurer or by a majority of the directors, showing the whole amount of real and personal property owned by the corporation, where located and where and how invested, the amount and nature of the property acquired during the year immediately preceding the date of the report, and the manner of the acquisition; the amount applied, appropriated or expended during the year immediately preceding such date, and the purposes, objects, or persons to or for which such applications, appropriations or expenditures have been made; and the names and places of residence of the persons who have been admitted to membership in the corporation during such year, which report shall be filed with the records of the corporation and an abstract thereof entered in the minutes of the annual meeting.

Section 2. Notice of Annual Meeting: Notice of the annual meeting of members shall be given by mailing, not less than ten (10) days nor more than forty (40) days before the meeting, a copy of the notice of such meeting to every member of the corporation directed to him at his address as it appears upon the records of the corporation.

Section 3. Special Meetings: Special meetings of the members, except as otherwise provided by law or by these by-laws, may be called at any time by the board of directors or by the President, and shall be called by the President or by the Secretary at the request in writing of a majority of the board of directors. Such request shall state the purpose or purposes of the proposed meeting.

Section 4. Notice of Special Meetings: Notice of each special meeting of the members shall be given by mailing, not less than ten (10) nor more than forty (40) days before the meeting, a copy of the notice of such meeting, stating the purpose or purposes for which the same is called, to each member directed to him at his address as it appears on the records of the corporation.

Section 5. Quorum: At any meeting of the members of the corporation a quorum shall consist of not less than twenty (20) voting members.

Section 6. Qualifications of Voters: Upon any question presented for vote to the membership, whether presented by mail or at a meeting of the members, each member entitled to vote pursuant to the provision of Section 6 of Article I shall be entitled to one (1) vote.

Section 7. Voting: Upon any question with respect to which a vote of the membership shall be required or deemed advisable, the board of directors may determine whether such vote shall be taken by mail or by ballot at the next meeting of the membership. In case the directors shall determine to take such vote by mail, either upon any question of administration or policy or upon the election of officers, directors or others, forms for the casting of such vote or for the casting of a ballot for the election of any such officers, directors, or others, shall be forwarded to the entire membership entitled to vote thereon at least thirty (30) days prior to the date upon which the count of such votes or ballots shall be made by the directors or tellers appointed for the purpose (the date of which count shall be incorporated in the advice sent to the respective members) and the results of such vote or ballot shall be determined by the directors or tellers upon the date fixed for such purpose and shall be valid, binding and of full force and effect precisely as if such vote had been taken in open meeting of the membership regularly called and duly held, provided always, that in order to render valid such

vote by mail, the number of votes cast shall be at least equal to the number of voting members required to constitute a quorum at any regular or special meeting of the membership.

Article III

Officers and Directors

Section 1. Officers Enumerated: The officers of the society shall be a President, a Vice President, a Secretary, a Treasurer, a Junior Past President, and an Editor of Publications.

Section 2. Directors Enumerated: The directors shall consist of the six (6) officers mentioned in Section 1, all of whom shall be, ex-officio, members of the board of directors, and five (5) directors-at-large.

Section 3. Eligibility and Election: Nine (9) directors and officers shall be elected by the voting members from among the regular and honorary members of the society. These directors shall consist of five (5) directors-at-large and the following officers of the society who shall be, ex-officio, members of the board of directors, to wit: president, vice president, secretary, and treasurer.

At the expiration of his term of office the president becomes the junior past president, one of the officers of the society, and ex-officio, a member of the board of directors.

The editor of publications shall be elected by the above-enumerated board of directors at an annual meeting of the board and shall upon such election become a voting member of such board.

Section 4. Terms of Office: The president and vice president shall be elected for terms of two (2) years.

The secretary and the treasurer shall be elected for terms of four (4) years.

No officer elected by the membership shall be eligible for re-election except when such eligibility is established by special action of the board of directors. This shall require an affirmative vote of three-fourths (3/4) of the entire board.

The junior past president shall serve until such time as his successor qualifies for the office by retiring from the office of president.

The editor of publications shall be elected for a term of four (4) years.

Members-at-large of the board of directors shall be elected for terms of four (4) years, except that at the first election following the formation of this corporation two (2) of these directors-at-large shall be elected for terms of two (2) years. At the expiration of the terms of these two directors-at-large their successors shall then be elected for terms of four (4) years as provided in the first sentence of this paragraph.

No member-at-large of the board of directors shall be eligible for re-election.

The term "re-election" as used in these by-laws shall be construed to mean only the election of an individual to succeed himself.

Section 5. Time of Election and Assumption of Duties: Election by the members of officers and members-at-large of the board of directors shall take place at an annual meeting of members in October, or by mailed ballot as provided in the following section.

The officers and directors elected shall assume their duties at the close of such annual meeting.

Section 6. Mode of Election: Elections shall be by ballot cast by mail as provided in Section 7 of Article II unless the board of directors shall, prior to the holding of any annual meeting of the membership, determine to hold such election at such annual meeting, in which case the members entitled to vote shall be notified of such determination. Where more than two candidates are nominated for any one office the voting shall be by preferential ballot. Nominations shall be made by a nominating committee appointed by the President and approved by the board of directors. This committee shall consist of five (5) regular members of the corporation, at least one (1) of whom shall be a past president.

Notices of the nominations made by the nominating committee shall be sent to all regular members at least thirty (30) days before the date on which the ballots are forwarded to the members. Additional nominations may be made by request of ten (10) members qualified to vote provided they are forwarded to the Secretary within twenty (20) days after notices of the nominations are sent out.

Section 7. Vacancies: In the event of a vacancy occurring among the officers or the directors-at-large, the remaining directors, by an affirmative vote of a majority thereof, may fill such vacancy until the next annual meeting of the corporation.

Section 8. Organization of the Board of Directors: The President of the society shall be the chairman of the board of directors.

The Secretary of the society shall be the secretary of the board of directors. He shall keep complete and precise records of the business transacted by the board of directors and shall send copies of the minutes to each member of the board and shall file copies of the minutes in a permanent record book provided for the purpose.

Section 9. Meetings of the Directors: The annual meeting of the board of directors shall be held in October. Meetings of the directors may be held at such other times as the chairman of the board may appoint. The directors may adopt rules and regulations governing their procedure, the notices to be given of meetings, the times and places of holding of regular meetings, and other matters with respect to the conduct of their business. The vote of directors upon any proposition, except as otherwise provided by these by-laws, may be obtained by mail during an interim between meetings.

Section 10. Quorum: At any meeting of the board of directors a majority of the entire membership of the board shall constitute a quorum and, except as otherwise provided by these by-laws, a majority of such a quorum shall decide any question that may come before the meeting.

Section 11. Duties of Officers: The duties of the President, Vice President, Secretary, and Treasurer of the society shall be the usual ones performed by such officers.

The Treasurer shall be chargeable with the responsibility for the general funds of the corporation and for such special funds as may be from time to time placed in his custody or control by order of the board of directors, and he shall pay the bills of the corporation which have been approved by the board of directors either through adoption of an annual budget or by special action.

The custody of other special funds may be vested by the board of directors in agents other than the Treasurer.

The Treasurer and each other officer or agent having custody or control of any funds shall report periodically and at least once each year to the board of directors with respect to the management and disposition of the fund or funds with which he is chargeable, and the board of directors shall in turn incorporate such reports in their annual report to the members.

The Editor of Publications shall have general charge under the supervision of the board of directors, of the publications of the society as set forth in Section 1 of Article V.

Section 12. Bonding: The Treasurer and each other officer or agent having custody or control of any funds of the corporation shall be bonded for an amount to be fixed by the board of directors.

Section 13. Prohibitions on Officers: No director or other officer of the society shall receive, directly or indirectly, any salary, compensation or emolument from the corporation, either as such officer or director or in any other capacity, unless authorized by the by-laws of the society, or by the affirmative vote of two-thirds (2/3) of all the directors.

No director or other officer of the society shall be interested, directly or indirectly, in any contract relating to the operations conducted by the society, nor in any contract for furnishing supplies thereto, unless authorized by the by-laws of the society or by the affirmative vote of two-thirds (2/3) of the directors.

Article IV

Committees and Delegates

Section 1. Committees: The President may appoint, for a term not to exceed the remainder of his term of office and subject to the approval of the board of directors, such committees as may further the objects of the Society, and such committees shall have such duties and responsibilities as shall be delegated to them by the President and the board of directors, but shall be subject at all times to the direction and control of the board of directors. Unless otherwise specifically provided in its appointment, each such committee shall serve until it has been discharged or its successor has been appointed.

Section 2. Representatives and Delegates: The President shall submit to the board of directors nominations for representatives and delegates to other organizations. Representatives and delegates shall be elected by the board of directors and for such terms as their respective offices may require. Unless otherwise specifically provided in

his appointment each such representative or delegate shall serve until he has been discharged or his successor has been appointed.

Article V

Publications and Endowments

Section 1. Publications: The society shall publish a journal devoted to the advancement of optics and may publish such other scientific publications as may be deemed advisable by the board of directors from time to time. In addition to the Editor of Publications, who shall be a member of the board of directors as hereinabove provided, the board of directors may appoint six or more associate editors whose terms of office shall be six (6) years, one-third (1/3) of them to be appointed biennially, but such appointments to be at all times subject to revocation by the board of directors. Every regular, associate, corporation, and honorary member of the society shall be entitled to receive the journal of the society.

Section 2. Endowments: The corporation may accept endowments for medals, scholarships, or for other purposes, and such endowments shall be maintained in accordance with the directions of the board of directors and the wishes of the donors.

Article VI

Finances

Section 1. Finances: The respective funds of the corporation shall be deposited with such bank or banks, trust company or trust companies as the board of directors may from time to time designate, and shall be subject to withdrawal by such officers or agents as may from time to time be designated by the board of directors.

Article VII

Corporate Seal

Section 1. Form of Seal: The seal of the corporation shall be circular in form with the words "Optical Society of America, Inc., New York" in the outer circle and "1932" together with the official emblem of the society within the inner circle. Such seal as is impressed on the margin hereof is hereby adopted as the corporate seal of the corporation.

Article VIII

Amendments

Section 1. Amendments by Directors: These by-laws may be amended, altered, or repealed in whole or in part by the affirmative vote of the majority of the entire board of directors expressed in writing or cast at any regular or special meeting of the board with or without mention thereof in the notice of the meeting at which the vote is taken. If, however, any such amendment is adopted at a meeting without mention thereof in the notice of such meeting, a copy of such amendment shall be mailed immediately after the meeting to each director not present at the meeting.

Section 2. Amendments by Members: These by-laws may be amended, altered, or repealed in whole or in part by the affirmative vote of a majority of the regular members of the society in good standing expressed in writing as provided in Section 7 of Article II or cast at any annual meeting of the members or at any special meeting of the members where such proposed action has been incorporated in the notice of the meeting. Amendments by the members may be made notwithstanding any previous action of the board of directors.

Honorary Members

Edward Bausch Charles Fabry

Officers and Directors

1938

President —R. C. Gibbs *Secretary* —L. B. Tuckerman
Vice President—K. S. Gibson *Treasurer*—Henry F. Kurtz

The Board of Directors consists of the above officers; the Editor of the Journal; the Past President and five Directors-at-large:

Past President—A. C. Hardy *Editor of Journal*—F. K. Richtmyer

Directors-at-Large

H. P. Gage G. R. Harrison William F. Meggers Brian O'Brien A. G. Worthing

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THE JOURNAL OF THE OPTICAL SOCIETY OF AMERICA

Editorial Board

F. K. Richtmyer, *Editor*

Associate Editors

Term ending December 31, 1939		Term ending December 31, 1941		Term ending December 31, 1943	
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K. S. Gibson	W. B. Rayton	E. O. Hulburt	Leigh Page	C. J. Davisson	L. A. Jones
L. O. Grondahl	H. B. Williams	H. E. Ives	A. H. Pfund	A. C. Hardy	G. S. Monk

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Committee on Finance: H. F. Kurtz, *Chairman*
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H. A. Barton, L. A. Jones

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W. B. Rayton, K. S. Gibson

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A. C. Hardy, G. R. Harrison, H. E. Ives, L. A. Jones, L. W. McKeehan

Committee on Date of Election:
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Advisory Committee on Progress Reports:
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A. C. Hardy, A. G. Worthing

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C. L. Bausch, C. W. Frederick

Representatives and Delegates to Other Organizations

Representatives on the Governing Board of the American Institute of Physics:

W. B. Rayton (term expires February, 1939)
E. C. Crittenden (term expires February, 1940)
A. C. Hardy (term expires February, 1941)

Representatives on the Division of Physical Sciences of the National Research Council:

L. B. Tuckerman (Executive Member) (term expires June 30, 1939)
W. E. Forsythe (term expires June 30, 1940)
G. B. Pegram (term expires June 30, 1941)

Representatives on the Council of the American Association for the Advancement of Science:

R. C. Gibbs (term expires February, 1939)
Elmer Hutchisson (term expires February, 1940)

Representative on the Motion Pictures Sectional Committee of the American Standards Association:

A. C. Hardy (term expires October, 1939)

Representatives on the U. S. National Committee of the International Commission on Illumination:

Frank Benford, *Chairman*
L. A. Jones A. C. Hardy
(terms expire November, 1939)

Representative on the American National Committee on International Congresses on Photography:

A. C. Hardy (term expires October, 1941)

Representatives on the Inter-Society Color Council:

L. A. Jones, Chairman, voting delegate
I. H. Godlove, voting delegate
D. B. Judd, voting delegate
J. W. Forrest
H. P. Gage
A. C. Hardy
W. B. Van Arsdel
(terms expire October, 1938)

Representative and Alternate on A. S. A. Sectional Committee on Safety Code for Specifications and Methods of Test for Safety Glass—Z26

E. D. Tillyer H. F. Kurtz, *Alternate*
(terms expire October, 1939)

Past Officers

UNDER the original by-laws, the term for all officers was one calendar year beginning January 1st following their election in October. Under an amendment adopted in October 1921, which became effective for terms beginning January 1, 1922, the terms of office were as follows: For president, vice president and elected members of the council, two years; for secretary and treasurer, five years. Under the by-laws adopted May 26, 1933, the term of the secretary and treasurer was changed to four years, and all officers to take office at the end of the annual meeting.

Under the original constitution the Executive Council consisted of the president, vice president, secretary, treasurer, the retiring president, and four members-at-large. Under an amendment adopted in October 1917, the editor of the Journal was also a member of the Executive Council. Under another amendment adopted in September, 1922, the assistant editor-in-chief and business manager of the Journal was also a member of the Executive Council. On the transfer of the publication office to the American Institute of Physics, the office of assistant editor-in-chief and business manager was discontinued. On the incorporation of the Society the Executive Council was changed to the Board of

Directors and the four elected members of the Council to five Directors-at-large, serving for a term of four years.

Year	*President*	*Vice President*	*Secretary*	*Treasurer*	*Elected Members of Executive Council*
1916 (*Part Year July-Dec.*)	P. G. Nutting	G. E. Hale	F. E. Ross	Adolph Lomb	Norman Macbeth C. E. K. Mees J. P. C. Southall F. E. Wright
1917	P. G. Nutting	G. E. Hale	F. E. Ross	Adolph Lomb	Norman Macbeth C. E. K. Mees J. P. C. Southall F. E. Wright
1918	F. E. Wright	F. K. Richtmyer	P. G. Nutting	Adolph Lomb	H. E. Ives W. B. Lancaster L. T. Troland J. P. C. Southall
1919	F. E. Wright	F. K. Richtmyer	P. G. Nutting	Adolph Lomb	H. E. Ives W. B. Lancaster L. T. Troland J. P. C. Southall
	(No election was held. By unanimous consent the by-laws relating thereto were suspended and it was voted to continue the 1918 officers through the year 1919.)				
1920	F. K. Richtmyer	C. A. Skinner	P. D. Foote	Adolph Lomb	L. A. Jones C. H. Kerr P. G. Nutting I. G. Priest
1921	J. P. C. Southall	C. E. Mendenhall	I. G. Priest (*Elected for one-year term, beginning Jan. 1, 1921.*)	Adolph Lomb	W. E. Forsythe L. A. Jones C. E. K. Mees P. G. Nutting
1922	L. T. Troland	H. E. Ives	I. G. Priest (*Elected for five-year term, beginning Jan. 1, 1922, but resigned, April 26, 1924.*)	Adolph Lomb	A. Ames, Jr. W. E. Forsythe H. G. Gale Ernest Merritt
1923	L. T. Troland	H. E. Ives	I. G. Priest	Adolph Lomb	A. Ames, Jr. W. E. Forsythe H. G. Gale Ernest Merritt
1924	H. E. Ives	W. E. Forsythe	I. G. Priest (*Resigned, April 26*) F. K. Richtmyer *Acting*	Adolph Lomb	K. T. Compton C. W. Keuffel P. G. Nutting F. E. Wright
1925	H. E. Ives	W. E. Forsythe	F. K. Richtmyer *Acting*	Adolph Lomb	K. T. Compton C. W. Keuffel P. G. Nutting F. E. Wright
1926	W. E. Forsythe	I. G. Priest	C. C. Bidwell (F. K. Richtmyer *Acting part time.*)	Adolph Lomb	K. T. Compton C. W. Keuffel C. E. K. Mees P. G. Nutting
1927	W. E. Forsythe	I. G. Priest	C. C. Bidwell	Adolph Lomb	K. T. Compton C. W. Keuffel C. E. K. Mees P. G. Nutting
1928	I. G. Priest	L. A. Jones	C. C. Bidwell	Adolph Lomb	L. R. Ingersoll P. E. Klopsteg W. F. Meggers A. H. Pfund

1929	I. G. Priest	L. A. Jones	C. C. Bidwell *(Resigned June, 1929; L. B. Tuckerman appointed to fill unexpired term beginning July 1, 1929.)*	Adolph Lomb	L. R. Ingersoll P. E. Klopsteg W. F. Meggers A. H. Pfund
1930	L. A. Jones	E. C. Crittenden	L. B. Tuckerman	Adolph Lomb	A. H. Compton I. C. Gardner P. E. Klopsteg E. D. Tillyer
1931	L. A. Jones	E. C. Crittenden	L. B. Tuckerman	Adolph Lomb	A. H. Compton I. C. Gardner P. E. Klopsteg E. D. Tillyer
					Directors-at-Large
1932	E. C. Crittenden	W. B. Rayton	L. B. Tuckerman	Adolph Lomb *(Died Sept. 30, 1932; Henry F. Kurtz appointed to fill unexpired term.)*	G. S. Fulcher A. C. Hardy T. R. Wilkins A. G. Worthing
1933	E. C. Crittenden	W. B. Rayton	L. B. Tuckerman	H. F. Kurtz	G. S. Fulcher A. C. Hardy T. R. Wilkins A. G. Worthing
1934	W. B. Rayton	A. C. Hardy	L. B. Tuckerman	H. F. Kurtz	A. H. Compton C. W. Keuffel H. E. Ives G. B. Pegram R. C. Gibbs
1935	W. B. Rayton	A. C. Hardy	L. B. Tuckerman	H. F. Kurtz	A. H. Compton C. W. Keuffel H. E. Ives G. B. Pegram R. C. Gibbs A. H. Compton
1936	A. C. Hardy	R. C. Gibbs	L. B. Tuckerman	H. F. Kurtz	K. S. Gibson G. R. Harrison H. E. Ives C. W. Keuffel
1937	A. C. Hardy	R. C. Gibbs	L. B. Tuckerman	H. F. Kurtz	A. H. Compton K. S. Gibson G. R. Harrison H. E. Ives C. W. Keuffel
1938	R. C. Gibbs	K. S. Gibson	L. B. Tuckerman	H. F. Kurtz	H. P. Gage*** G. R. Harrison** W. F. Meggers*** Brian O'Brien*** A. G. Worthing*
	(Term expires Oct., 1939)	*(Term expires Oct., 1939)*	*(Term expires Oct., 1941)*	*(Term expires Oct., 1941)*	*(*Term expires Oct., 1938)* *(**Term expires Oct., 1939)* *(***Term expires Oct., 1941)*

Past Presidents of The Optical Society of America

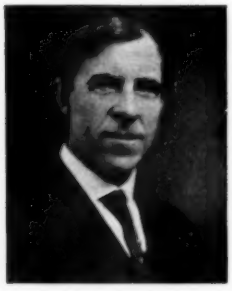
1916–1937

P. G. Nutting
1916–1917

Loyd A. Jones
1930–1931

F. E. Wright
1918–1919

E. C. Crittenden
1932–1933



F. K. Richtmyer
1920

Leonard T. Troland
1922–1923

W. E. Forsythe
1926–1927

W. B. Rayton
1934–1935

J. P. C. Southall
1921

Herbert E. Ives
1924–1925

Irwin G. Priest
1928–1929

A. C. Hardy
1936–1937

Meetings

No. in "Annual" Series	*Date*	*Place*	*President*	*Secretary*	*Publication of Minutes*
1	Dec. 28, 1916[2]	New York	Nutting	Ross	J.O.S.A. **1**, 45 (1917).
2	1917[2]	(Meeting called for Pittsburgh was cancelled on account of war.)			
3	Dec. 27, 1918[2]	Baltimore	Wright	Nutting	Science **49**, 52 (1919). (See also J.O.S.A., Jan.–March, 1919.)
4	Feb. 26–27, 1920[1]	New York	Wright (Actg.)	Nutting (Actg.)	J.O.S.A. **4**, 80–82 (1920).
5	Dec. 27–29, 1920[2, 3]	Chicago	Richtmyer	Foote	J.O.S.A. **5**, 210–212 (1921). Science **53**, 318–320 (1921).
6	Oct. 24–26, 1921[4]	Rochester	Southall	Priest	J.O.S.A. & R.S.I. **6**, 407–415 (1922). Science 501–502; Nov. 18, 1921.
7	Oct. 25–28, 1922	Washington	Troland	Priest	J.O.S.A. & R.S.I. **7**, 59–102 (1923). Science 636–640; Dec. 1, 1922.
8	Oct. 25–27, 1923	Cleveland	Troland	Priest	J.O.S.A. & R.S.I. **8**, 21–45 (1924). Science 451–452; Nov. 30, 1923
9	Oct. 23–25, 1924	Boston	Ives	Richtmyer (Actg.)	J.O.S.A. & R.S.I. **10**, 283–297 (1925).
	Feb. 27–28, 1925[3]	New York	Ives	Richtmyer / Southall (Actg.)	J.O.S.A. & R.S.I. **11**, 125–134 (1925).
10	Oct. 29–31, 1925	Ithaca	Ives	Richtmyer (Actg.)	J.O.S.A. & R.S.I. **12**, 473–494 (1926).
	Feb. 26–27, 1926[3]	Montreal	Forsythe	Richtmyer (Actg.)	J.O.S.A. & R.S.I. **13**, 303–308 (1926).
11	Oct. 21–23, 1926	Philadelphia	Forsythe	Bidwell	J.O.S.A. & R.S.I. **14**, 133–148 (1927).
	Feb. 25–26, 1927[3]	New York	Forsythe	Bidwell	J.O.S.A. & R.S.I. **14**, 470–476 (1927).
12	Oct. 20–22, 1927	Schenectady	Forsythe	Bidwell	J.O.S.A. & R.S.I. **16**, 113–123 (1928).
	Feb. 24–25, 1928[3]	New York	Priest	Bidwell	J.O.S.A. & R.S.I. **16**, 329–335 (1928).
13	Nov. 1–3, 1928[5]	Washington	Priest	Bidwell	J.O.S.A. & R.S.I. **18**, 143–286 (1929).
	Feb. 22–23, 1929[3]	New York	Priest	Bidwell	J.O.S.A. & R.S.I. **18**, 441–446 (1929).
14	Oct. 24–26, 1929[6]	Ithaca	Priest	Tuckerman	J.O.S.A. **20**, 139–172 (1930)
15	Oct. 30–Nov. 1, 1930	Charlottesville	Jones	Tuckerman	J.O.S.A. **21**, 137–153 (1931).
	Feb. 26–28, 1931[3]	New York	Jones	Tuckerman	J.O.S.A. **21**, 431–442 (1931).
16	Oct. 22–24, 1931	Rochester	Jones	Tuckerman	J.O.S.A. **22**, 1–18 (1932).
	Feb. 25–27, 1932[3]	Cambridge	Crittenden	Tuckerman	J.O.S.A. **22**, 422–434 (1932).
17	Oct. 13–15, 1932	Lake Placid Club	Crittenden	Tuckerman	J.O.S.A. **23**, 114–121 (1933).
	Feb. 24–25, 1933[3]	New York	Crittenden	Tuckerman	J.O.S.A. **23**, 189–195 (1933).
18	Oct. 19–21, 1933	Buck Hill Falls	Crittenden	Tuckerman	J.O.S.A. **24**, 51–58 (1934).
	Feb. 23–24, 1934[3]	New York	Rayton	Tuckerman	J.O.S.A. **24**, 159–164 (1934).
19	Oct. 18–20, 1934	Washington	Rayton	Tuckerman	J.O.S.A. **25**, 42–49 (1935).
	Feb. 22–23, 1935[3]	New York	Rayton	Tuckerman	J.O.S.A. **25**, 197–202 (1935).
20	Oct. 24–26, 1935	Philadelphia	Rayton	Tuckerman	J.O.S.A. **26**, 221–231 (1936).
	Feb. 21–22, 1936[3]	New York	Hardy	Tuckerman	J.O.S.A. **26**, 302–305 (1936).
21	Oct. 29–31, 1936[7]	New York	Hardy	Tuckerman	J.O.S.A. **27**, 56–64 (1937).
	Mar. 5–6, 1937	Corning	Hardy	Tuckerman	J.O.S.A. **27**, 220–226 (1937).
22	Oct. 14–16, 1937	Lake Placid Club	Hardy	Tuckerman	J.O.S.A. **28**, 46–53 (1938).
	Feb. 25–26, 1938[3]	New York	Gibbs	Tuckerman	J.O.S.A. **28**, 174–180 (1938).

[1] This meeting was originally scheduled to be held with A.A.A.S. in St. Louis, Dec. 1919, but was postponed on account of railway strike.
[2] With A.A.A.S.
[3] Joint meeting with American Physical Society.
[4] Helmholtz Memorial Meeting.
[5] Michelson Meeting.
[6] Thomas Young Memorial Meeting.
[7] Joint meeting with the other founder societies of the American Institute of Physics.

Alphabetical Directory of Members

R indicates Regular Member; RL, Regular Life Member; A, Associate Individual Member; AC, Associate Corporation Member; H, Honorary Member.

The number affixed to each name is the serial number in order of election to membership. It gives the reference to the original record of election in the Society's archives.

ABBOT, CHARLES G. 270 R
Smithsonian Institution, Washington, D. C.

ADAMS, ELLIOT Q. 163 R
Lamp Development Laboratory,
Nela Park, Cleveland, Ohio.

ALBERTSON, WALTER EDWARD 642 R
Dept. of Physics, Mass. Inst. of Technology,
Cambridge A, Mass.

ALBRIGHT, JOHN G. 726 R
Case School of Applied Science, Cleveland, Ohio.

ALDEN, GARDNER R. 1072 A
15 Hillcrest Road, Framingham, Mass.

ALDEN, HAROLD L. 711 R
Yale University Observatory, Southern Station,
Milner Park, Johannesburg, South Africa.

ALDRICH, L. B. 423 R
Smithsonian Institution, Washington, D. C.

ALTMAN, FRED E. 243 R
Hawk-Eye Works, Eastman Kodak Company,
Rochester, N. Y.

AMERICAN OPTICAL COMPANY 638 AC
Southbridge, Massachusetts.

AMES, ADELBERT, JR. 1 R
Dartmouth College, Hanover, N. H.

ANDERSON, J. A. 64 R
Mt. Wilson Observatory, Pasadena, Calif.

ANDERSON, WILMER C. 1009 A
34 Irving St., Cambridge, Mass.

ANDERSON, W. T., JR. 573 R
440 Clifton Ave., Newark, N. J.

ANGIER, JAMES F. 972 A
239 Maple Ave., Takoma Park, Md.

ANTHES, ERNST H. 951 R
50 W. 50th St., New York, N. Y.

ARTHUR, JOHN M. 683 R
Boyce Thompson Inst. for Plant Res., Yonkers, N. Y.

ASK, REYNOLD E. 1054 A
3808 Garfield St., Washington, D. C.

ASTER, ALVIN KLINTWORTH 720 A
48 Beech St., East Orange, N. J.

AUSTIN, J. B. 798 R
Research Laboratory, U. S. Steel Corporation,
Lincoln Highway, Kearny, N. J.

AVIGNONE, FRANK T., JR. 1108 A
Lincoln Avenue, Massapequa, L. I., N. Y.

BAHN, CARL E. 942 R
80 Crosman Terrace, Rochester, N. Y.

BALINKIN, ISAY A. 1070 A
University of Cincinnati, Cincinnati, Ohio.

BALL, J. A. 964 R
Box 791, Hollywood, Calif.

BALLARD, STANLEY S. 1126 A
University of Hawaii, Honolulu, T. H.

BANERJEE, GYANENDRA NATH 851 A
Scientific Instrument Co., Ltd.,
240 Hornby Road, Fort, Bombay, India.

BARBROW, L. E. 736 R
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BARNES, BENTLEY T. 1120 A
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Nela Park, East Cleveland, Ohio.

BARSTOW, ORMOND 1002 A
64 Oxford St., Cambridge, Mass.

BARTLETT, BOYD W. 828 A
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BARTLETT, WILLIAM W. 1004 A
49 Bicknell St., Quincy, Mass.

BARTON, HENRY A. 899 R
American Institute of Physics,
175 Fifth Ave., New York, N. Y.

BARTON, VOLA PRICE 757 R
2500 Ken Oak Road, Baltimore, Md.

BATES, FREDERICK J. 239 R
National Bureau of Standards, Washington, D. C.

BAUSCH, CARL L. 681 RL
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BAUSCH, EDWARD 2 H
Bausch & Lomb Optical Company, Rochester, N. Y.

BAUSCH & LOMB OPTICAL COMPANY 576 AC
Rochester, New York.

BAYLEY, PAUL L. 619 R
Department of Physics, Lehigh University,
Bethlehem, Pa.

BAZZONI, CHARLES B. 390 R
Randal Morgan Laboratory,
University of Pennsylvania, Philadelphia, Pa.

BEAMS, JESSE W. 571 R
Box 1192, University Station, Charlottesville, Va.

BEITEL, ROBERT J., JR. 1032 R
American Optical Co., Southbridge, Mass.

BELLER, WILLIAM C. 803 A
18 West 85th St., New York, N. Y.

BELL TELEPHONE LABORATORIES, INC. 676 AC
463 West St., New York, N. Y.

BELT, HALLER 989 A
593 Market St., San Francisco, Calif.

BENFORD, FRANK 152 R
Research Laboratory, General Electric Co.,
Schenectady, N. Y.

BENFORD, JAMES R. 997 A
Bausch & Lomb Optical Company, Rochester, N. Y.

BENNETT, A. H. 181 R
Spencer Lens Company, Buffalo, N. Y.

BERENS, CONRAD 294 R
111 E. 59th St., New York, N. Y.

BIELICKE, WM. 75 R
% Astro-Gesellschaft, 25–27 Lahnstrasse, Berlin-Neukoelln, Germany.

BIRGE, RAYMOND T. 397 R
Le Conte Hall, University of California, Berkeley, Calif.

BISHOP, FRED M. 186 R
Eastman Kodak Company, Rochester, N. Y.

BITTINGER, CHARLES 240 R
Duxbury, Mass.

BLACKHAM, WILFRID 668 A
393 Fairmount Ave., Jersey City, N. J.

BLAIR, JULIAN M. 948 R
University of Colorado, Boulder, Colo.

BLAKE, EDWIN M. 436 A
Drawer A, Pratt Station, Brooklyn, N. Y.

BLANCHARD, JULIAN 34 R
463 West St., New York, N. Y.

BOCH, ALFRED 1043A
% E. Leitz, Inc., 60 E. 10th St., New York, N. Y.

BOEDER, PAUL 1031 R
90 Hartwell St., Southbridge, Mass.

BOSSOLASCO, MARIO 968 A
Instituto Geofisico e Geodetico R. Univ.
Via Citconvallazione all'Andria, Messina, Italy.

BOVIE, WILLIAM T. 237 R
13 West St., Waterville, Maine.

BRACKETT, FREDERICK S. 844 R
National Institute of Health,
24th & E Sts., N. W., Washington, D. C.

BRECKENRIDGE, F. CHAPIN 594 R
5301 Broad Branch Road, Washington, D. C.

BRICE, BROOKS A. 882 R
Food & Drug Administration,
U. S. Dept. of Agriculture, Washington, D. C.

BRICKWEDDE, FERDINAND G. 446 R
Cryogenic Laboratory,
National Bureau of Standards, Washington, D. C.

BROCKWAY, ELLSWORTH M. 937 R
4 Arnold Park, Rochester, New York.

BRONK, DETLEV WULF 473 R
Johnson Foundation for Medical Physics,
University Hospital, Philadelphia, Pa.

BROOKE, CLINTON L. 923 A
% R. A. Innis, 1607 47th St., Des Moines, Iowa.

BROWN, FREDERICK LYONS 597 R
P. O. Box 1052, University, Charlottesville, Va.

BROWN, SHERWOOD FISKE 1023 A
St. Lawrence University, Canton, N. Y.

BROWN, THOMAS BENJ. 358 R
2810 23rd St., N., Arlington, Va.

BUCHTA, J. W. 463 R
Dept. of Physics, University of Minnesota,
Minneapolis, Minn.

BURGESS, KENNETH E. 994 A
601 Cass St., Trenton, N. J.

BURKA, SAMUEL M. 134 R
Wright Field, Dayton, Ohio.

BURNS, KEIVIN 238 R
Allegheny Observatory, N. S. Pittsburgh, Pa.

BURROUGHS, ROBERT E. 486 A
Research Laboratory Kodak Park Works,
Eastman Kodak Co., Rochester, N. Y.

BUTTOLPH, L. J. 360 R
General Electric Vapor Lamp Co.,
410 Eighth St., Hoboken, N. J.

CADY, WALTER GUYTON 393 R
Scott Laboratory, Middletown, Conn.

CALKINS, TRACY H., JR. 1114 A
2035 N. Meridian, Indianapolis, Ind.

CAMPBELL, CLARENCE J. 753 A
Dartmouth Medical School, Hanover, N. H.

CAMPBELL, STUART 984 R
Institute of Applied Optics, University of Rochester,
Rochester, N. Y.

CARBONARA, VICTOR E. 895 R
18 Stonehenge Road, Rockville Centre, N. Y.

CARRAGAN, G. HOWARD 1060 R
Rensselaer Polytechnic Institute, Troy, N. Y.

CARROLL, BURT H. 577 R
489 Sagamore Drive, Rochester, N. Y.

CARTER, EDNA 755 R
Vassar College, Poughkeepsie, N. Y.

CATTELL, J. MCK. 297 R
Garrison-on-Hudson, New York.

CECCARINI, OLINDO ORESTE 583 R
325 S. Bedford Drive, Beverly Hills, Calif.

CHALUPSKI, VICTOR 1008 A
78 Sterling St., Brooklyn, N. Y.

CHAMBERS, GORDON A. 474 R
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Davis, Raymond
Dorsey, Herbert Grove
Dorsey, N. E.
Emerson, Walter B.
Finn, Alfred N.
Fowle, Frederick E.
Gardner, I. C.
Gibson, K. S.
Haupt, Geraldine Walker
Hubbard, Donald
Hulburt, Edward O.
Humphreys, Curtis Judson
Humphreys, W. J.
Ives, James E.
Judd, Deane B.
Judson, Lewis V.
Kiess, C. C.
Maris, H. B.
Maxwell, Louis R.
Meggers, William F.
Meyer, J. Franklin
Mohler, F. L.
Neeland, Gerald Kent
Nickerson, Dorothy
Nutting, P. G.
O'Bryan, Henry M.
Peters, C. G.
Phelps, Francis P.
Radford, Lawrence
Schaub, Wallace R.
Scribner, Bourdon Francis
Skinner, C. A.
Slater, John M.
Souder, Wilmer
Stimson, H. F.
Talbott, Francis Leo
Teele, Ray P.
Tilton, Leroy W.
Tool, Arthur Q.
Tuckerman, L. B.
Whiting, William J.
Wright, Fred E.
Zwillinger, Max

GEORGIA

Savannah
Knowles, Frederick L.

ILLINOIS

Champaign
Van Arsdel, W. B.
Chicago
Compton, Arthur H.
Dershem, Elmer
Foote, Paul C.
Gaertner Scientific Corp.
Gale, Henry G.
Gradle, Harry
Jacobsohn, Samuel
Kliever, Waldo H.
Klopsteg, Paul E.
Klüver, Heinrich
McMaster, A. J.
Monk, George Spencer
Ross, Charles Harris
Stone, Carrington H.
Thompson, Roy E.
Evanston
Spence, B. J.
Peoria
Swaim, Verne Frank
Urbana
Kunz, Jakob
Loomis, Francis Wheeler
Waukegan
Pfanstiehl, Carl
Wilmette
Klapperich, Alfred J.

INDIANA

Indianapolis
Calkins, Tracy H., Jr.
Duckwall, Frank E.
Muncie
Waggoner, Jack H.
North Manchester
Ulrey, Clayton T.
Terre Haute
Howlett, B. A.

IOWA

Ames
Kunerth, William
Woodrow, Jay W.
Des Moines
Brooke, Clinton L.
Iowa City
Stewart, George Walter
Tyndall, E. P. T.
Sioux City
Gwinn, Ira J.

KANSAS

Wichita
Weber, Louis R.

LOUISIANA

New Orleans
Johnson, H. M.

MAINE

Brunswick
Bartlett, Boyd W.
Orono
Crofutt, Charles Burton
Fitch, A. L.
Waterville
Bovie, William T.

MARYLAND

Baltimore
Barton, Vola Price
Clark, Janet Howell
Ferree, C. E.
Friedenwald, J. S.
Hubbard, John C.
Karrer, S.
Macht, David I.
Munsell, A. E. O.
Newhall, Sidney M.
Pfund, A. H.
Sloan, Louise L.
Spry, Walter T.
Chevy Chase
Insley, Herbert
Wensel, H. T.
Curtis Bay
Nutting, Robert D.
Takoma Park
Angier, James F.

MASSACHUSETTS

Amherst
Stifler, W. W.
Arlington
Perry, John E.
Belmont
Hamilton, Parker
Boston
Forbes, Alexander
McCarthy, Eugene F.
Rines, David
Sage, John W.
Young, Clinton J. T.
Bridgewater
Wylie, Robert Russell
Cambridge
Albertson, Walter Edward
Anderson, Wilmer C.
Barstow, Ormond
Compton, Karl T.
Duntley, Seibert Quimby
Eastham, Melville
Grabau, Martin
Hardy, Arthur C.
Harrison, George R.
Harvey, George Graham
Hauser, Ernst A.
Lyman, Theodore
Mann, David W.
Moon, Parry H.
Nottingham, Wayne B.
Oldenberg, Otto
Pope, Arthur
Schwarz, Edward Robinson
Sears, Francis W.
Sterner, John
Stetson, Harlan T.
Stockbarger, Donald Charles
Turner, Arthur Francis
Vose, Robert W.
Chelsea
Greenwood, Willard P.
Dorchester
Weiss, Milton Louis
Duxbury
Bittinger, Charles
Framingham
Alden, Gardner R.
Hingham Center
Whitmore, William F.
Holyoke
Denmark, H. S.
Longmeadow
Draves, Carl Z.
Malden
Norman, Daniel
Medford
Harrison, J. R.
Melrose
Hall, George L.
Newton Centre
Ellis, Frederick W.
Newtonville
Jarrell, Richard F.
Northampton
Mohler, Nora May
Norton
Shook, G. A.
Quincy
Bartlett, William W.
Roslindale
Morton, Richard F.
Somerville
Sperduto, Anthony
Tousey, Richard
Southbridge
American Optical Co.
Beitel, Robert J., Jr.
Boeder, Paul
Glancy, Anna Estelle
Morrow, John F., Jr.
Neumueller, Julius F.
Tillyer, Edgar D.
Wells, John M.
South Hadley
Laird, Elizabeth R.
Waltham
Ott, Harry G.
Wellesley
McDowell, Louise S.
Wilson, Lucy
Wellesley Farms
Land, Edwin H.
Weston
Hopkins, Robert E.
Williamstown
Crawford, F. H.
Woods Hole
Pond, Samuel E.

MICHIGAN

Ann Arbor
Higbie, Henry Harold
Kraus, Edward H.
Meyer, Charles F.
Randall, H. M.
Sawyer, Ralph A.
Sleator, William Warner
Vincent, Harvard Burton
Detroit
Judd, Harold D.
Mayo, Philip R.
Poetker, Albert H.
Rassweiler, Gerald M.
East Lansing
Morrison, Edwin
Kalamazoo
Rood, Paul
Midland
Grebe, John J.
Pontiac
McMath, Robert R.

MINNESOTA

Minneapolis
Buchta, J. W.
Distad, Merril
Ferrari, Charles G.
Stenstrom, Wilhelm
Tate, John T.
Valasek, J.
Northfield
Hetle, E.
Rochester
Sheard, Charles
St. Paul
Hustrulid, Andrew

MISSOURI

Columbia
Reese, Herbert M.
St. Louis
Macelwane, James B.
Shahan, William Ewing

NEBRASKA

Lincoln
Jensen, J. C.

Omaha
Hayden, Charles K.

NEW HAMPSHIRE

Durham
Howes, Horace L.
Moran, Clement
Hanover
Ames, Adelbert, Jr.
Campbell, Clarence J.
Gliddon, Gordon H.
Ogle, Kenneth N.
Proctor, Charles A.
Tanch, Joseph W.
Nashua
Davis, Harold M.
Whitefield
Maltby, Margaret E.

NEW JERSEY

Bloomfield
Rentschler, H. C.
Bound Brook
Pineo, Orrin Weston
Royer, George L.
Caldwell
Taylor, T. Smith
Chatham
Smith, Eastman
Cranford
Doolan, Leonard W., Jr.
East Orange
Aster, Alvin Klintworth
Hillman, Conway D.
Elizabeth
Weinhart, Howard W.
Harrison
Ulrey, Dayton
Hoboken
Buttolph, L. J.
Hodge, Percy
Huber, Charles J.
Keuffel, Carl W.
Keuffel & Esser Co.
Jersey City
Blackham, Wilfrid
Kearny
Austin, J. B.
Merchantville
Patterson, J. Edward
Montclair
Mili, Gjon
Newark
Anderson, W. T., Jr.
Exton, William G.
Ranger, R. H.
Parlin
Conklin, O. E.
South Amboy
Jacobsen, Arthur E.
Owen, E. Robert
South Orange
Houskeeper, William G.
Teaneck
Walton, John F.
Trenton
Burgess, Kenneth E.
Westfield
Gray, Arthur W.
West Orange
Edison, Theodore M.

NEW YORK

Amsterdam
Vincent, Mabel S.
Annandale-on-Hudson
Mestre, Harold
Aurora
Gaehr, P. F.
Brooklyn
Blake, Edwin M.
Chalupski, Victor
Coulter, Calvin B.
Harris, Lawrence
Kollmorgen, Frederick L. G.
Paul, M. Rea
Roberts, Samuel H.
Buffalo
Bennett, A. H.
Estey, Roger Shepherd
Ripley, D. L.
Spencer Lens Co.
Canton
Brown, Sherwood Fiske
Smith, John F.
Corning
Corning Glass Works
Gage, H. Phelps
Littleton, Jesse T., Jr.
Elmhurst
Eckweiler, Howard J.
Forest Hills
Zieler, Hans Wolfgang
Garrison-on-Hudson
Cattell, J. McK.
Geneva
Dimmick, Forrest L.
Haussmann, Alfred C.
Spengler, John Arthur
Hamilton
Gleason, Paul R.
Hudson
Rankin, Charles W.
Ithaca
Gage, Simon H.
Gibbs, R. C.
Grantham, G. E.
Howe, Harley E.
Merritt, Ernest
Murdock, Carleton C.
Richtmyer, F. K.
Wilber, David T.
Jamaica
Lutz, Frederick W.
Johnson City
Ketcham, Henry C.
Kenmore
Peck, William F.
Larchmont
Mayer, William
Long Island City
Killian, Thomas J.
Massapequa
Avignone, Frank T., Jr.
Mount Vernon
Wetzel, Reinhard A.
New York City
Anthes, Ernst H.
Barton, Henry A.
Beller, William C.
Bell Telephone Laboratories, Inc.
Berens, Conrad
Blanchard, Julian
Boch, Alfred
Chauncey, A. Wallace
Cooley, J. P.
Darrow, Karl K.
Davis, Bergen
Davisson, C. J.
Dudley, Beverly
Dunn, Gano
Dunning, John R.
Failla, G.
Farwell, H. W.
Ferguson, W. F. C.
Finkelstein, Isidore Sigmund
Foss, Carl E.
Free, Edward E.
Goldsmith, Alfred N.
Granville, Walter C.
Hecht, Selig
Herriott, William
Hotaling, Elmer E.
Interchemical Corporation
Ives, Herbert E.
Jones, Grandville Reynard
Kanolt, C. W.
Kingsbury, Edwin F.
Leventhal, J. F.
Little, William F.
Marrison, W. A.
Millar, Preston S.
Miller, Osborn M.
Mitchell, Dana P.
Moffitt, G. W.
Müller, Ralph Holcombe
Newcomer, H. Sidney
Parker, Allan E.
Pegram, George B.
Reynolds, F. W.
Ryer, E. Leroy
Schmid, Fred
Schurman, Ferdinand
Schwarzchild, Myron M.
Severinghaus, Willard L.
Shackleford, Benj. E.
Southall, James P. C.
Stewart, Irvin
Treleaven, Clifford L.
Webb, Harold W.
Williams, Horatio B.
Wurzburg, Francis Lewis, Jr.
Painted Post
Gage, O. A.
Pelham
Macbeth, Norman
Poughkeepsie
Carter, Edna
Wick, Frances G.
Richmond Hill, L. I.
Walters, Frank Paul
Riverdale
Rosin, Seymour
Rochester
Altman, Fred E.
Bahn, Carl E.
Bausch, Carl L.
Bausch, Edward
Bausch & Lomb Opt. Co.
Benford, James R.
Bishop, Fred M.
Brockway, Ellsworth M.
Burroughs, Robert E.
Campbell, Stuart
Carroll, Burt H.
Chesna, John

NEW YORK (continued)

Clark, Walter
Cleveland, H. W.
Cook, Alan A.
Crabtree, John I.
Dittmer, Arthur F.
DuBridge, Lee A.
Eisenhart, M. H.
Evans, Ralph Merrill
Fairbanks, Floyd C.
Fassin, Gustave
Flint, Edward Francis, Jr.
Forrest, John W.
Foster, Leon V.
Frederick, C. W.
Graeper, Walter W.
Hall, Vincent C.
Herzberger, Max
Hickman, Kenneth C. D.
Hoadley, H. Orlo
Holmes, F. M. Emerson
Jobe, Frederick W.
Hutchings, Franklyn C.
Johnson, Gerald A.
Jones, L. A.
Kingslake, Rudolf
Knop, Victor R.
Kurtz, Henry F.
Kurtz, John C.
Levin, Aaron A.
Lomb, Carl F.
Loveland, Roger P.
Lowry, Earl M.
McFarlane, John W.
McRae, Daniel B.
MacAdam, David L.
Mees, C. E. Kenneth
Miller, Oran E.
Morey, Donald R.
Morrison, Charles A.
Nitchie, Charles C.
Noyes, Bradford, Jr.
Nurnberg, C. R.
O'Brien, Brian
Perrin, Fred H.
Potter, Rowland S.
Rayton, Wilbur B.
Russell, Marion Edward
Schoen, Arthur L.
Scott, Murray R.
Sheppard, S. E.
Staud, Cyril J.
Steadman, Luville T.
Steiner, Oscar
Stevens, Paul Wellman
Taylor, Joseph F.
Tompkins, Frederick A.
Trivelli, A. P. H.
Tuttle, Clifton M.
Weaver, Karl S.
Webb, Julian H.
Wilkins, T. R.
Wilsey, Rex B.

Rockville Centre
Carbonara, Victor E.

St. Albans
Fairchild, Charles O.
Scheick, J. A.

Schenectady
Benford, Frank
Dushman, Saul
Koller, Lewis R.
Luhr, Overton
Michaelson, J. L.
Rice, C. W.
Studer, Frank J.
Wold, P. I.

Staten Island
Lindemann, Howard Charles

Syracuse
Porter, R. A.
Warntz, Adrian L.

Troy
Carragan, G. Howard

Valley Stream
Kelly, James H.

White Plains
Sharp, Clayton H.

Yonkers
Arthur, John M.

NORTH CAROLINA

Chapel Hill
Ruark, Arthur Edward

Charlotte
Palmer, Roy A.

Paw Creek
Elting, John Philip

OHIO

Akron
Householder, F. F.

Chillicothe
Lewis, Lester C.

Cincinnati
Balinkin, Isay A.
Sperti, George S.

Cleveland
Adams, Elliot Q.
Albright, John G.
Cobb, Percy W.
Craig, Russell M.
Forsythe, W. E.
Hodgman, Chas. D.
Luckiesh, M.
Miller, Dayton C.
Mountcastle, Harry William
Spencer, Charles Douglas
Taylor, A. Hadley

Cleveland Heights
Holladay, Lewis L.
Lundin, C. A. Robert

Columbus
Hesthal, Cedric E.
Russell, Howard W.

Dayton
Burka, Samuel M.

East Cleveland
Barnes, Bentley T.

Findlay
Roots, Yale Kirby

Marietta
Phillips, T. D.

Newark
Rolph, Thomas W.

New Concord
Martin, Paul E.

Oberlin
Taylor, Lloyd W.

Toledo
Dunipace, Donald W.

OREGON

Corvallis
Garman, John Clifton
Weniger, W.

PENNSYLVANIA

Bethlehem
Bayley, Paul L.
Larkin, Chas. R.

Bryn Mawr
Helson, Harry

Charleroi
Stone, Conrad A.

Easton
McQuarrie, W. C.

McKeesport
Warga, Mary Elizabeth

Narberth
Tabor, Lewis P.

Palmerton
Gallagher, John Martin, Jr.
Gamble, David L.

Philadelphia
Bazzoni, Charles B.
Bronk, Detlev Wulf
Dike, Paul Harrison
Duncan, Ralph W.
Fulweiler, W. H.
Harrison, T. R.
Kaspereit, Otto K.
Myers, Jos. W.
Razek, Joseph
Richards, Horace C.
Scott, W. E.
Stewart, Thomas S.
Summers, R. D.
Thomas Co., Arthur H.
Wetlaufer, L. A.

Pittsburgh
Burns, Keivin
Foote, Paul D.
Hower, Harry S.
Hutchisson, Elmer
Lytle, Wm. Orland
Nathanson, Jonas B.
Taylerson, Ewart S.
Tillotson, E. Ward
Venable, William Mayo
Worthing, A. G.

Reading
Hettinger, Edwin L.

State College
Davey, Wheeler P.

Swarthmore
Korff, Serge A.
Swann, W. F. G.

Swissvale
Grondahl, L. O.

Towanda
Swindells, Frank E.

Upper Darby
Holst, L. J. R.

RHODE ISLAND

Newport
Eppley, Marion

Providence
Graham, Clarence H.
Hays, C. Earl

SOUTH CAROLINA

Columbia
Mercer, Charles F.

TENNESSEE

Nashville
Slack, Francis G.

TEXAS

College Station
Silvey, O. W.
Houston
Kannenstine, Fabian M.
MacMahon, Andrew Merritt
Ricker, Norman
Weaver, Paul
Lubbock
George, E. F.

UTAH

Provo
Marshall, Milton

VERMONT

Burlington
Holmes, R. M.
Springfield
Finn, Robert R.

VIRGINIA

Arlington
Brown, Thomas Benj.
Charlottesville
Beams, Jesse W.
Brown, Frederick Lyons
Snoddy, Leland B.
Sparrow, Carroll M.
Richmond
Loving, R. E.
Rosslyn
Hunter, Richard S.
University
Geldard, Frank Arthur
Hoxton, L. G.
Williamsburg
Merrymon, William Walter

WASHINGTON

College Place
Kretschmar, G. G.

WEST VIRGINIA

Morgantown
Colwell, Robert Cameron
Molby, Fred A.

WISCONSIN

Appleton
Davis, Myrl N.
Madison
Mack, Julian Ellis
Stebbins, Joel

HAWAII

Honolulu
Ballard, Stanley S.

2. Foreign Members According to Country

AUSTRALIA

Esserman, N. A.

CANADA

DeLury, Ralph E.
Foster, Alice W.
Gilchrist, L.
Jacobsen, Ratje C.
Landon, Fred
McLay, Alexander Boyd
Middleton, W. E. Knowles
O'Leary, Wm. J.
Ruedy, Richard

CHINA

Hu, Kang Fuh
Lee, John Y.
Supao, Ting

ENGLAND

Curtis, William Edward
Fleming, A. P. M.
Martin, Louis Claude
Merton, Thomas R.
Pirani, Marcello
Lord Rayleigh
Renwick, F. F.
Turner, W. E. S.
Twyman, Frank

FRANCE

Draeger, R. H.
Fabry, Charles
Long, B.
Pieron, Henri
Riviere, Jean Maurice

GERMANY

Bielicke, Wm.
Harting, Hans
Hase, Rudolph
Jentzsch, Felix

HOLLAND

de Groot, Willem

INDIA

Banerjee, Gyanendra Nath
Raman, C. V.

ITALY

Bossolasco, Mario

JAPAN

Kakinuma, Usaku
Matsuda, C.
Sugiura, Yoshikatu

NOVA SCOTIA

Henderson, George H.

PANAMA

Oldach, W. H.

SOUTH AFRICA

Alden, Harold L.

SWITZERLAND

Turrettini, Edmond